

Making a Splash - or not!

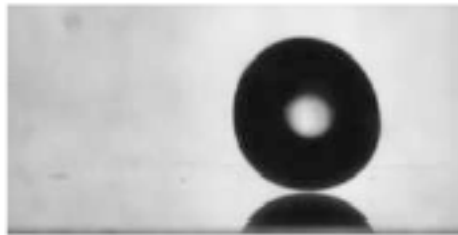
Non-Equilibrium and Non-Linear Fluids and Related Systems

Sidney R. Nagel, University of Chicago, NSF DMR-0352777

**When a liquid drop falls, does it splash?
Of course! but not in vacuum!**

air

763 Torr



0 ms



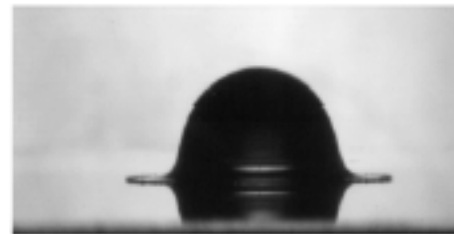
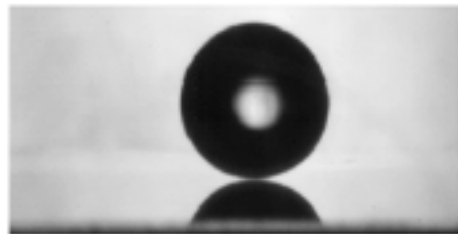
0.276 ms



0.552 ms

less air

233 Torr



**Something this basic (only now discovered)
must have important consequences for
industrial handling of liquids.**

No splash!

The photographs are from a high-speed movie that shows a drop of alcohol falling at a velocity of 3.7 m/sec. onto a dry smooth surface. In the upper panel, the drop is falling in a background of nitrogen at atmospheric pressure, 763 Torr. When it hits the surface it splashes. In the bottom panel, all the conditions are the same except that the background pressure is reduced to 233 Torr. In this case, there is no splash. The critical pressure, where the splashing goes away, depends on the velocity of the drop on impact. It also depends on the gas used. (We have studied helium, nitrogen, krypton and sulfur-hexafluoride.)

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Education: During the period 2000 to 2004, the PI has mentored **8 undergraduates or high-school students** (the two working currently, are Megan Harvey [high school] and Rachael Smith [undergrad.]) and **12 grad students**: Sarah Case, Xiang Cheng, Itai Cohen, Eric Corwin, Adam Marshall, Milica Medved, Matthias Möbius, Nathan Mueggenburg, Dan Mueth, Jason Wyman, Lei Xu and Ling-nan Zou.

Nagel as co-director of the national Science Olympiad and at the SciTech Museum/UofC workshop in Aurora.

Outreach: In order to communicate the beauty of the phenomena studied, the PI has presented images from his research to a wider public with photographs appearing in newspapers, textbooks, and art galleries. He has also served as co-director of the National Science Olympiad for junior-high and high school students.

